1999 Cancer in Washington

Annual Report of the
Washington State Cancer Registry

August 2001

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Office of Epidemiology

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Data from the Behavioral Risk Factor Surveillance System (BRFSS) were prepared by Katrina Wynkoop Simmons, Ph.D., Center for Health Statistics, Research Services Section, Washington State Department of Health.

Special acknowledgments:

The wide variety of health care facilities who report cancer data in Washington, their medical staffs, medical records personnel and especially cancer registrars, whose participation and cooperation help to make the Washington State Cancer Registry a tool in cancer control and prevention.

This work was funded in part by Centers for Disease Control and Prevention Cooperative Agreement #U75/CCU010709.

Data from the Cancer Surveillance System of Western Washington of the Fred Hutchinson Cancer Research Center are funded, in part, by Contract No. NO1-CN-67009 from the Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute with additional support from the Fred Hutchinson Cancer Research Center.

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Executive Summary

This annual report of the Washington State Cancer Registry summarizes information on new cases of cancer (incidence) and death due to cancer (mortality) for Washington state residents. It represents the ongoing effort by the Department of Health, the Fred Hutchinson Cancer Research Center, the Blue Mountain Oncology Program, physicians, and cancer registrars throughout Washington.

This report is different from reports for previous years: it is shortened and available only at this website. The primary reason for this approach is that census data for 1999 based on the 2000 census counts are not yet available. However, since the estimate for the total population of Washington State based on the 1990 census, subsequent births and deaths, estimated migration and other factors is relatively consistent with the 2000 census, we are providing state-level information for cancers diagnosed in 1999. With our 2000 report, we will again provide county-level information and information on cancer in different race groups.

Cancer is a heterogeneous group of diseases characterized by uncontrolled growth and spread of abnormal cells. The various forms of cancer were responsible for 10,641 deaths among Washington residents in 1999, comprising approximately twenty-five percent of all deaths. In 1999, cancer (all types combined) was the most common cause of death among adults ages 45 to 74 years and the second leading cause across all age groups. Some form of cancer will likely strike one in three Washingtonians in their lifetime. In 1999, there were 28,993 new cases of cancer diagnosed in Washington.

The report provides information on cancer of all types combined and the 24 cancer sites most frequently diagnosed in Washington residents. The information can be used at the state and county level to identify the burden of morbidity and mortality associated with each type of cancer. This information, combined with information on cancer prevention, early detection, and treatment, is useful for program planning and policy development aimed at reducing the burden of cancer.

The five most common types of cancer reported among Washington residents during 1999 were breast, prostate, lung, colorectal, and melanoma.

1 5,374 new cases and 722 deaths from female breast cancer were reported in 1999. Breast cancer was the second most common cause of cancer mortality for women. The age-adjusted rate of new breast cancers diagnosed in Washington women in 1999 was higher than the rate for the national comparison figures. However, the rate at which Washington women die of breast cancer was similar to the rate for the US as a whole. Several factors could be contributing to the differences between Washington and the US, including differences in racial composition, reproductive patterns, treatment modalities, and completeness of data collection. Differences in stage of diagnosis do not seem to play a role. The best strategy for prevention of breast cancer mortality is early detection through screening. In 1999, approximately 70% of women in Washington met the National Cancer Institute's recommendations for mammography.

2 4,317 new cases and 599 deaths from prostate cancer were reported for 1999. It was the second leading cause of cancer death among men. Washington's rates are higher than the national rates for new cases of prostate cancer, but similar to the national rates for deaths from prostate cancer. It is not clear whether the difference between the state and national rates reflect true differences or differences in screening, data collection or other factors. Experts continue to disagree on the benefits of screening for early detection of prostate cancer.

3 3,672 new cases of lung cancer were reported in 1999. 3,052 Washingtonians died of lung cancer, making it the leading cause of cancer mortality. The age-adjusted rate of new lung cancer cases in Washington was higher than the national rate, while mortality rates were similar. Differences in diagnosis, treatment, and reporting of new cases may explain the differences in rates of new lung cancers. Reduction in smoking remains the major focus of efforts to prevent lung cancer.

4 2,911 new cases and 994 deaths from colorectal cancer were reported in 1999. The age-adjusted rate for new cancers of the colon and rectum was slightly lower in Washington than in the US as a whole. Washington's mortality rate was also slightly lower than the national rate. Regular screening has been shown to reduce mortality. (NCI, 2001) In 1999, approximately one-third of Washington residents met the recommendations for screening. Research indicates that diets high in fat, protein, calories, alcohol and meat and low in calcium and folate may increase risk for colorectal cancer. (NCI, 2001) The American Cancer Society recommends a diet that includes at least five servings of fruit and vegetables every day and six servings of foods from other plant sources, such as grain products, rice or beans. (ACS, 2001) Regular physical activity may reduce the risk for cancer of the colon and rectum, and smoking may increase risk. (ACS, 2001; NCI, 2001)

5 1,816 new cases and 178 deaths from melanoma of the skin were reported in 1999. The age-adjusted rate for new melanomas was higher in Washington than in the US; Washington's mortality rate was also slightly higher. Several factors may contribute to this phenomenon including differences between Washington and the US as a whole in racial composition and completeness of reporting. Avoiding sunburn, especially early in life, is effective in reducing incidence of melanoma. (NCI, 2001) The American Cancer Society recommends routine examination of the skin for reducing mortality from melanoma. (ACS, 2001). The National Cancer Institute advises patients that routine examination of the skin increases the chances of finding melanoma while it is still in an early, treatable stage. (NCI, 2001)

Preface

This annual report of the Washington State Cancer Registry (WSCR) incorporates cancer incidence data for the entire state. It represents the ongoing effort by the Department of Health, the Fred Hutchinson Cancer Research Center, the Blue Mountain Oncology Program, physicians, and cancer registrars throughout Washington. This information is presented in the hope that it will assist health care providers, public health officials, voluntary organizations, and concerned citizens in their efforts to prevent and control cancer in Washington.

This report is different from reports for previous years: it is shortened and available only at this website. The primary reason for this approach is that census data for 1999 based on the 2000 census counts are not yet available and current county population estimates are known to be appreciably different from those in the 2000 census. Additionally, more work needs to be done to determine how to best use 2000 census data to estimate the population for different racial groups. The 2000 census allowed reporting of more than one race and as a result, there are now incompatibilities between the way race is collected in WSCR and in the census. Users of other health datasets are facing similar incompatibilities and we are working to assure a consistent approach in using race information. However, since the estimate for the total population of Washington State based on the 1990 census, subsequent births and deaths, estimated migration and other factors is relatively consistent with the 2000 census, we are providing state-level information for cancers diagnosed in 1999. With our 2000 report, we will again provide county-level information and information on cancer in different race groups.

Introduction

Cancer is a heterogeneous group of diseases characterized by uncontrolled growth and spread of abnormal cells. In 1999, there were 28,993 new cases of cancer diagnosed in Washington. The various forms of cancer were responsible for 10,641 deaths among Washington residents in 1999, comprising approximately twenty-five percent of all deaths. In 1999, cancer (all types combined) was the most common cause of death among adults ages 45 to 74 years and the second leading cause across all age groups. Some form of cancer will likely strike one in three Washingtonians in their lifetime.

Illness and death due to cancer are increasingly preventable through two types of strategies. Primary prevention strategies aim to reduce, usually through lifestyle change, the likelihood that a healthy individual will develop cancer. Alternatively, secondary prevention is accomplished by screening asymptomatic people to diagnose cancers at an early, more readily treatable stage.

This report summarizes information on new cases of cancer (incidence) and deaths due to cancer (mortality) for Washington state residents and for comparative purposes, the US as a whole. The report provides information on cancer of all types combined and the 24 cancer sites most frequently diagnosed in Washington residents. This information can be used at the state and county level to identify the burden of morbidity and mortality associated with each type of cancer. This information, combined with information on cancer prevention, early detection, and

treatment, is useful for program planning and policy development aimed at reducing the burden of cancer.

The Five Most Common Cancer Sites

The most common types of cancer reported among Washington residents during 1999 were breast, prostate, lung, colorectal, and melanoma.

1 5,374 new cases of female breast cancer were reported. Breast cancer was by far the most frequently diagnosed cancer among women. Responsible for 722 deaths in 1999 it was the second most common cause of cancer mortality for women. While the age-adjusted rate of new breast cancers diagnosed in Washington women in 1999 continues to be higher than the national comparison rate, the rate at which Washington women died of breast cancer continues to be below the national rate. Several factors may contribute to this phenomenon.

Washington's demographics may play a role. In both Washington and the US as a whole, white women are more likely to be diagnosed with breast cancer, but black women are more likely to die from breast cancer. US census figures for 1999 indicate that compared to the US, Washington has a larger proportion of white women (89% compared to 82% nationally) and a smaller proportion of black women (4% compared to 13% nationally). (US Census Bureau, August 2000) Rates of breast cancer are also higher for women in higher compared to lower socioeconomic groups, possibly related to reproductive patterns, such as older age at first birth among women in higher socioeconomic groups. (Shottenfeld and Fraumeni, 1996) Household income provides one measure of socioeconomic group and the US Census Bureau estimates a higher household median income in Washington compared to the US (approximately $47,000 per year in Washington for 1998-1999 compared to $40,000 in the US). (US Census Bureau, Current Population Surveys, 1999, 2000) Additional research is needed to determine relative ages at first birth.

While early stage at diagnosis[1] plays a role in survival, stage at diagnosis does not seem to explain the finding that the rate of new breast cancer cases was higher in Washington than in the US as a whole, but mortality rates were similar. Washington women seem to be diagnosed at similar stages as women nationally, based on data available through SEER*Stat Version 4.0 CD-ROM public-use file. Differences in treatment of breast cancer and completeness of data collection may also play a role.

Because the cause of most breast cancer is unknown and most of the known risk factors are not easy to modify, the best strategy for prevention of breast cancer mortality is early detection and treatment. Regular breast cancer screening with mammography reduces the number of deaths from breast cancer for women between 50 and 69 years. (NCI, 2001) Experts continue to disagree on the benefits of mammography for women between 40 and 49 years and for women

[1] See page 13 for a discussion of stage at diagnosis.

older than 69 years. Additionally, the National Cancer Institute concludes that the optimal time period between mammograms has not been determined. (NCI, 2001). Nonetheless, the American Cancer Society recommends mammography every year for women beginning at age 40. (ACS, 2001) A clinical breast exam often accompanies mammography or routine physical examinations. The American Cancer Society recommends a clinical breast exam every year beginning at age 40. While evidence about the value of self-breast exam for reducing mortality from breast cancer is inconclusive (NCI, 2001), the American Cancer Society recommends monthly self-breast exams beginning at age 20. (ACS, 2001)

The 1999 Washington State Behavioral Risk Factor Surveillance System[2] indicates that approximately 57% of women in Washington age 40 and older reported a mammogram in the past year and approximately 72% reported a mammogram within the last two years. Approximately 61% and 76% of women age 40 and older reported a clinical breast exam in the past one and two years, respectively.

2 4,317 new cases of prostate gland cancer were reported in 1999 making prostate cancer the most commonly reported malignancy among men. It was the second leading cause of cancer death among men, killing 599 men in 1999.

No effective means are currently available to prevent the development of prostate cancer. The American Cancer Society recommends that health care providers offer prostate-specific antigen blood testing and digital rectal examination yearly for men age 50 and older. They further recommend that screening begin at age 45 for men at high risk, such as men with first degree relatives with prostate cancer and African American men. However, the National Cancer Institute concludes that there is insufficient evidence to establish that prostate cancer screening reduces mortality from the disease. (NCI, 2001)

3 3,672 new cases of lung cancer were reported for 1999. 3,052 Washingtonians died of lung cancer, making it the leading cause of cancer mortality. The age-adjusted rate of new lung cancer cases in Washington was higher than the national rate. Cigarette smoking is the major cause of lung cancer. Based on the 1999 Behavioral Risk Factor Surveillance Survey[3], the proportions of people who currently smoke are about the same in Washington and the US as a whole. However, lung cancer caused by smoking may take several decades to develop and we do not know whether there was more smoking in Washington than in the US several decades ago. More complete reporting of new cases in Washington compared to the US may also explain the elevated rate in Washington. The mortality rates were similar in Washington and the US as a whole.

Cigarette smoking is by far the most important cause of lung cancer. Nationally, approximately 90% of male and 72% of female lung cancer deaths are attributed

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[2] The Washington Behavioral Risk Factor Surveillance System is a telephone survey of English-speaking, non-institutionalized adults.

[3] The Behavioral Risk Factor Surveillance System (BRFSS) is a telephone survey of non-institutionalized adults. It is administered in all 50 states, the District of Columbia and Puerto Rico. The Washington BRFSS includes English-speaking people only.

to smoking. (CDC, 1997) Although a new x-ray technique has been successful in detecting early lung cancer in smokers and former smokers, it is not known whether this early detection will result in decreased mortality. Currently, neither the American Cancer Society nor the National Cancer Institute recommends routine screening for lung cancer. (ACS, 2001; NCI, 2001) Reduction in smoking remains the major focus of efforts to prevent lung cancer.

4 2,911 new cases of colon and rectal cancer were reported in 1999. Colorectal cancer was the state's second leading cause of cancer death, resulting in the loss of 994 lives in 1999. The age-adjusted rate for new cancers of the colon and rectum was slightly lower in Washington than in the US as a whole. Washington's mortality rate was also slightly lower than the national rate.

The National Cancer Institute concludes that screening of the stool for invisible amounts of blood (fecal occult blood test) every year or every two years beginning at age 50 reduces death from cancer of the colon and rectum. The National Cancer Institute also concludes that regular visual examination of the lower bowel (sigmoidoscopy) beginning at age 50 may reduce mortality from colorectal cancer. The National Cancer Institute does not believe that there is sufficient evidence to determine how often people should have sigmoidoscopies. (NCI, 2001) The American Cancer Society recommends several screening options. Their preferred option is similar to that of the National Cancer Institute and includes yearly fecal occult blood tests and sigmoidoscopy every five years beginning at age 50 for the general population. The American Cancer Society recommends more frequent screening, beginning at earlier ages for those who may be more susceptible to colorectal cancer, such as people with a history of colorectal cancer in their family. (ACS, 2001)

The Washington State Behavioral Risk Factor Surveillance System[4] indicates that in 1999, approximately 25% of Washingtonians age 50 and older reported a fecal occult blood test in the past year and approximately 35% reported a test within the last two years. Approximately 36% of Washingtonians age 50 and older reported a sigmoidoscopy within the past five years.

The National Cancer Institute states that colorectal cancer most likely results from complex interactions between inherited susceptibility and environmental factors. (NCI, 2001) Research indicates that diets high in fat, protein, calories, alcohol and meat and low in calcium and folate may increase risk for colorectal cancer. (NCI, 2001) The American Cancer Society recommends a diet that includes at least five servings of fruit and vegetables every day and six servings of foods from other plant sources, such as grain products, rice or beans. (ACS, 2001) Regular physical activity may reduce risk for cancer of the colon and rectum, and smoking may increase risk. (ACS 2001; NCI, 2001)

[4] The Washington Behavioral Risk Factor Surveillance System is a telephone survey of English-speaking, non-institutionalized adults. Questions on colorectal cancer screening are asked every other year.

5 1,816 new cases of melanoma of the skin were reported in 1999. Melanoma accounted for 178 deaths in Washington residents. The age-adjusted rate for new melanomas was higher in Washington than in the US as a whole. Washington's mortality rate was also slightly higher than in the US. Several factors may contribute to higher rates in Washington. Rates are much higher in white people than in people of other races. In Washington, 89% of the population is white compared to 82% nationally. (US Census Bureau, August 2000) Additionally, the reporting of new cases of melanoma may be more complete in Washington than nationally.

There is evidence that avoiding sunburns, especially during childhood and adolescence, may be effective in preventing melanoma. (NCI, 2001) Since some studies suggest that sunscreens do not protect against melanoma (they do protect against other types of skin cancer), avoiding exposure to the sun through other methods, such as wearing protective clothing, may be important in decreasing risk for melanoma. (NCI, 2001; ACS, 2001) The National Cancer Institute does not provide consistent advice on the importance of skin examination for early detection of melanoma. While it concludes that there is insufficient evidence that routine examination of the skin is effective in reducing mortality from melanoma, it also advises patients that routine examination of the skin increases the chance of finding melanoma while it is still in an early, treatable stage. (NCI, 2001).

The American Cancer Society recommends skin examination by a doctor every three years for people 20 to 40 years old and every year for people older than 40 years. The American Cancer Society also recommends monthly self-examination and provides guidelines for recognizing signs of the disease. These include moles that are asymmetrical (that is, one side does not match the other), have irregular borders (that is, the edges of the mole are ragged or notched); have more than one color or shade; or are larger than about ¼ inch across. The guidelines can be easily remembered as A (**a**symmetrical), B (irregular **b**orders), C (more than one **c**olor) and D (**d**iameter of more than ¼ inch). A change in the in size, shape or color of a mole may also be a sign of melanoma. (ACS, 2001)

Washington State Cancer Registry

Background

In 1990, RCW 70.54.230 made cancer a reportable condition in Washington and mandated the Department of Health to establish a statewide cancer registry program. Under this mandate, the Department established the Washington State Cancer Registry (WSCR) in 1991. The registry is dedicated to fulfillment of the legislative intent "...to establish a system to accurately monitor the incidence of cancer in the state of Washington for the purposes of understanding, controlling, and reducing the occurrence of cancer in this state." Since 1994, funding for WSCR has been provided, in part, through the Centers for Disease Control and Prevention's National Program of Cancer Registries. This program is designed to standardize data

collection and provide information for cancer prevention and control programs at the local, state, and national levels.

Data Collection

Cancer cases are collected through a combination of contracts with two regional cancer registries and cases from independent reporting facilities (such as hospitals and clinics) with in-house cancer registry programs. The contractors and reporting facilities are responsible for case-finding, abstracting information on cancer from medical sources, and reporting cases to the statewide registry. The Cancer Surveillance System (CSS) of the Fred Hutchinson Cancer Research Center provides data on cancer cases from 13 counties in Western Washington, covering the majority of the state's population including the largest urban center of Seattle. CSS has been in operation since 1974 as a participant in the Surveillance Epidemiology and End-Results (SEER) Program of the National Cancer Institute.

The remainder of the state is covered by reporting facilities with in-house cancer registry programs and the Walla Walla-based Blue Mountain Oncology Program (BMOP). BMOP is a consortium of cancer registries from 14 health care facilities in the Walla Walla, Tri-Cities, Sunnyside and Spokane areas. BMOP provides data from these facilities to WSCR. In addition, under contract to the Department of Health, BMOP provides staff to collect cases at facilities that do not have in-house cancer registries. WSCR also conducts regular data exchanges with cancer registries in 30 states. Most of Washington's out-of-state cases are reported by Oregon and Idaho, followed by Texas and Arizona.

Cancer cases are identified through reports from hospitals, pathology laboratories, radiation oncology centers, ambulatory surgical centers, cancer treatment centers, and physicians. Once the case is identified, an abstract of cancer information is completed within six months and quality assurance activities are carried out by the contractors and reporting facilities. Data files are transmitted from the contractors and reporting facilities to the state on a regular basis. WSCR is responsible for merging the data and finalizing the statewide data set, overall data quality assurance in accordance with national standards, and dissemination of cancer information to assist with cancer prevention and control efforts statewide.

The cancer reporting rules (246-102 WAC) currently define reportable cancers as "any malignant neoplasm, with the exception of basal and squamous cell carcinoma of the skin." Also specifically included are: 1) basal and squamous cell carcinoma of the external genital organs (vulva, labia, clitoris, prepuce, penis, anus, scrotum); 2) all brain tumors; and 3) cancer in situ, except cancer in situ of the uterine cervix. The legally required data for cancer reporting include patient demographics (such as age and sex) and medical information (such as type of cancer and date and stage at diagnosis) for all newly diagnosed cancers. Copies of Washington's cancer reporting legislation and regulations are available on request.

Report Contents

As noted above due to the unavailability of population counts based on the 2000 census, the annual report for 1999 has been shortened and is available only at this

website. Information for counties and by race can be found in the 1998 report. We plan to include county and race information again in our report for cancers diagnosed in 2000.

This report includes a summary of incidence and mortality for all cancers combined and for the 24 cancer sites most frequently diagnosed in Washington residents. Incidence data include cases newly diagnosed between January 1, 1999 and December 31, 1999, and reported to WSCR as of June 2001. This information covers the entire state and also includes new cases of cancer among Washington residents diagnosed in other states, such as Oregon and Idaho. Mortality statistics include deaths among Washington residents that occurred in 1999 where the underlying cause of death was cancer. The cancer may have been diagnosed before 1999. As with incidence, mortality data include Washington residents who die out-of-state. The appendices include technical notes, sources of information on the epidemiology and prevention of cancer, the membership of the WSCR Advisory Council and WSCR contact information.

The following material briefly describes the tables, graphs and charts in this report; the statistical methods used to produce each table, graph or chart; and special considerations for interpreting the data.

Tables, Charts and Graphs

Data Definitions and Sources

The Washington State Cancer Registry provides the number of new cases (incidence) of cancer as described above. Based on estimates of the expected number of cancer cases, the registry includes more than 95% of cases. Each cancer is coded to an International Classification of Diseases Oncology (ICD-O) code. The data definition provides the ICD-O codes used in each section. We have used definitions that are consistent with those used by the National Cancer Institute's SEER program.

The Washington State Department of Health, Center for Health Statistics provides information from death certificates on the number and causes of death. According to the National Center for Health Statistics, more than 99% of all deaths occurring in the United States are registered in the death certificate system. Accuracy of reporting specific causes of death varies since classification of disease conditions is a medical-legal opinion subject to the best information available to the physician, medical examiner, or coroner certifying the cause of death. We obtained the number of cancer deaths from the Vital Registration System Annual Statistical Files, Washington State Deaths 1980-1999 CD-ROM issued February 2001.

From 1980 –1998, the underlying cause of death was coded using the International Classification of Diseases, 9th Revision (ICD-9) coding system. Consistent with national requirements, beginning with deaths occurring in 1999, the Department of Health began using the International Classification of Diseases, 10th Revision (ICD-10). While the change from the ICD-9 to the ICD-10 resulted in substantive changes in rates for some causes of death, the effect of the coding change is minimal for cancer. For more information on the change from ICD-9 to ICD-10, see Comparability of Cause of Death Between ICD-9 and ICD-10: Preliminary Estimates.

The data definition provides the ICD-10 codes used in each section. We have used definitions that are consistent with those used by the SEER program. **For some cancer sites, including colorectal, liver, and leukemia and multiple myeloma, the SEER coding differs from the National Center for Health Statistics coding which may be used in other Department of Health reports.** Therefore, before comparing information from different reports, one must be sure that the definitions are consistent.

We obtained population estimates necessary for the calculation of rates from the Washington State Department of Social and Health Services, Research and Data Analysis. These estimates, called Washington State adjusted population estimates, were released in July 2000 and are based on estimates by Claritas, Inc. and the Washington State Office of Financial Management.

Incidence and Mortality Summary

These tables provide the number of new cases of cancer and the number of cancer deaths for Washington State residents in 1999. Since the numbers of new cases and deaths depend, in part, on the size of the population, we converted numbers to rates (e.g., the number of cases per 100,000 people) so that they may be compared among different regions or populations. For diseases, such as cancer, where incidence varies with age, the rates are age-adjusted to minimize the effect of different age distributions when comparing two geographic regions or populations.

Following the National Cancer Institute, we have age-adjusted rates using both the 1970 and 2000 US standard populations. **When making comparisons, one must be careful to compare age-adjusted rates that are adjusted to the same standard population.** Age-adjusted rates should not be compared to rates that are not age-adjusted (i.e., crude rates). Detail on our age-adjustment method is provided in Appendix A.

The final row of the incidence tables provides age-adjusted incidence rates from the eleven National Cancer Institute's SEER regions. These rates are from SEER*Stat version 4.0 CD-ROM public-use file containing data from 1973-1998, issued March 2001. The final row of the mortality tables provides age-adjusted mortality rates for the United States. The US mortality data were obtained from the SEER CanQues program (http://seer.cancer.gov/ScientificSystems/CanQues/). The SEER programs do not include data for 1999. Since cancer incidence and mortality rates do not change rapidly, we have provided 1998 national data for comparison.

Stage at Diagnosis

Stage at diagnosis refers to how far a cancer has spread from its site of origin when it is diagnosed. The stages, in order of increasing spread, are in situ, local, regional and distant. Cancers staged as local, regional, or distant are referred to as invasive. The reader should note that many publications of the National Cancer Institute and the Centers for Disease Control and Prevention report rates of invasive cancer only. Thus, caution must be exercised when comparing incidence rates contained in different reports.

The WSCR data contain the stage of disease at diagnosis coded according to the SEER guidelines.

In Situ	A tumor that fulfills all microscopic criteria for malignancy, but does not invade or penetrate surrounding tissue.
Localized	A tumor that is invasive but remains restricted to the organ of origin.
Regional	A tumor that has spread by direct extension to immediately adjacent organs or tissues and/or metastasized (spread through the blood stream) to regional lymph nodes, but appears to have spread no further.
Distant	A tumor that has spread by direct extension beyond the immediately adjacent organs or tissues, and/or metastasized to distant lymph nodes or other distant tissues.
Unstaged	Insufficient information available to determine the stage of disease at diagnosis.

We have provided the frequency distribution of cases according to their stage at diagnosis.

For most cancers, diagnosis at an early stage (in situ or local) results in improved survival. One standard measure of survival is the five-year survival rate that estimates the proportion of individuals with a given cancer who are living five years after diagnosis. We have not developed five-year survival rates for Washington state residents. However, we have provided the SEER five-year survival rate for each cancer. These statistics were obtained from SEER*Stat version 4.0 CD-ROM public-use file containing data from 1973-1998, issued in March 2001. This data file provides survival rates by stage of disease at diagnosis. The national five-year relative survival rates are calculated for cancer cases diagnosed between 1992 and 1998, based on follow-up of patients through 1998. The National Cancer Institute defines the relative five-year survival rate as the likelihood that a patient will not die from causes associated with their cancer within five years. The SEER*Stat program calculates this rate using a procedure described by Ederer, Axtell, and Cutler (1961) whereby the observed survival rate is adjusted for expected mortality. It is always larger than the observed survival rate. (Ries et al., 1999)

Incidence and Mortality Rate Trends

These charts provide incidence and mortality rates for several years for Washington residents per 100,000 population, age-adjusted to the US 2000 standard population. (See “Incidence and Mortality Summary” for a discussion of age-adjusted rates.) These tables show both changes in rates over time and the relationship between cancer incidence and mortality. Several notes of caution are advised when interpreting these rates.

- The population numbers used to compute the annual age-adjusted rates are based on estimates from the 1990 census, birth and death records, estimated migration and other factors. They are not based on data from the 2000 census. The rates may change slightly when the Office of Financial Management estimates the state's population from 1991 – 1999 based on the 2000 census figures.
- As described in "Data Definitions and Sources" above, the Department of Health began using the ICD-10 coding system for causes of death occurring in 1999. For most types of cancer, the effect of this change is minimal. Nonetheless, caution must be exercised in interpreting apparent trends in cancer mortality across the years of the coding change. For this reason, the trend chart shows a break between the mortality rates for 1991 – 1998 and the 1999 mortality rate.
- Unlike previous publications in which we age-adjusted rates in these charts to the 1970 US Standard Population, the rates in this release are age-adjusted to the 2000 US Standard Population.

What's Missing

Information on Prevention, Early Detection, and Treatment

Illness and death due to cancer are increasingly preventable through the application of growing knowledge about the causes of cancer, improved screening, and early diagnosis techniques, and more effective treatment. Extensive information on prevention through changing modifiable risk factors, early detection through routine screening, and preferred treatment modalities is available. We have not attempted to reproduce this information in detail. However, a brief summary of the most important public health aspects of cancer prevention and control follows in the paragraphs below. We have provided a resource list in Appendix B for those interested in more detail.

Screening for early detection has a clear role in reducing the disease burden due to cancer of the female breast, the uterine cervix, and colorectal cancer. (NCI, 2001) Experts do not agree on the value of routine screening of asymptomatic, average risk individuals for other cancer, such as skin, oral, testicular and thyroid cancer. However, the American Cancer Society supports clinical examination for early detection of skin, oral and testicular cancers, and self-examination for skin and testicular cancer. (ACS, 2001).

Major reductions in cancer rates and in an individual's likelihood of developing cancer are achievable through primary prevention strategies.

- The elimination of tobacco use would markedly reduce the incidence of lung cancer and reduce the incidences of cancer of the oral cavity and pharynx, esophagus, bladder, kidney, pancreas, colon, and rectum. (Schottenfeld and Fraumeni, 1996; NCI, 2001) Cancers of other sites, especially those of squamous cells, such as squamous cell cancer of the uterine cervix, may also be reduced by elimination of tobacco use. (Schottenfeld and Fraumeni, 1996).

- A diet low in fat, including five or more servings per day of fruits and vegetables, is likely to reduce the risk for cancer of the colon and rectum, oral cavity, esophagus, and stomach (Schottenfeld and Fraumeni, 1996). Additional studies have shown beneficial effects of a diet rich in fruits and vegetables for prevention of cancer at other sites, such as uterine cervix, ovary, endometrium, lung, larynx, and other organs, but the scientific literature for these sites is not as extensive and/or consistent as for the sites previously listed. (Schottenfeld and Fraumeni, 1996)
- Regular, moderate exercise has also been shown to have some benefit in the prevention of cancer at a number of sites, such as colorectal and breast (NCI, 2001).

The overall health benefit of these habits, and their lack of countervailing risk, makes them wise choices for cancer prevention. Health care providers, public health agencies, and voluntary organizations can provide the education that helps people make healthy choices.

While individual behavior plays an important role in cancer prevention, governmental and other societal entities have key roles as well. Policies and regulations that, for example, ban cigarette smoking, reduce youth access to tobacco, assure delivery of health services and control occupational exposures are important for preventing and controlling cancer.

References

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US Census Bureau. Population Estimates for States by Race and Hispanic Origin: July 1999, Internet release date August 30, 2000. http://www.census.gov/population/estimates/state/srh/srh99.txt

US Census Bureau. Income 1999 Table D, Median income of households by state. Current Population Survey, March 1999 and 2000. http://www.census.gov/hhes/income/income99/99tabled.html.

Appendices

Appendix A: Technical Notes

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Appendix A: Technical Notes

Age-Adjustment

Age-adjusted incidence rates were developed using the direct method. They were standardized to the age distributions of the United States 1970 and 2000 standard populations. Following the age-adjustment procedures used by the National Cancer Institute, we used five-year age groups in calculating age-adjusted rates. There may be small differences between the rates in this document and those in other publications that use 10-year age groups when age-adjusting.

The age distributions of the US standard populations are shown below.

US Standard Population Proportions

age group	1970 proportion	2000 proportion
0 - 4	0.0844	0.0691
5 - 9	0.0982	0.0725
10 - 14	0.1023	0.0730
15 - 19	0.0938	0.0722
20 - 24	0.0806	0.0665
25 - 29	0.0663	0.0645
30 - 34	0.0562	0.0710
35 - 39	0.0547	0.0808
40 - 44	0.0590	0.0819
45 - 49	0.0596	0.0721
50 - 54	0.0546	0.0627
55 - 59	0.0491	0.0485
60 - 64	0.0424	0.0388
65 - 69	0.0344	0.0343
70 - 74	0.0268	0.0318
75 - 79	0.0189	0.0270
80 - 84	0.0112	0.0178
85+	0.0074	0.0155

Direct method of age adjustment

Multiply the age-specific rates in the target population by the age distribution of the standard population.

$$\hat{R} = \sum_{i=1}^{m} s_i (d_i / P_i) = \sum_{i=1}^{m} w_i d_i$$

Where m is the number of age groups, d_i is the number of deaths in age group i, P_i is the population in age group i, and s_i is the proportion of the standard population in age group i. This is a weighted sum of Poisson random variables, with the weights being (s_i / P_i).

Confidence Intervals

Confidence intervals for the age-adjusted rates were calculated with a method based on the gamma distribution (Fay and Feuer, 1997). This method produces valid confidence intervals even when the number of cases is very small. When the number of cases is large the confidence intervals produced with the gamma method are equivalent to those produced with the more traditional methods, as described by Chiang (1961) and Brillinger (1986). The formulas for computing the confidence intervals are given below. Although the derivation of this method is based on the gamma distribution, the relationship between the gamma and Chi-squared distributions allows the formulas to be expressed in terms of quantiles of the Chi-squared distribution, which can be more convenient for computation.

$$\text{Lower Limit} = \frac{v}{2y}\left(c^2\right)^{-1}_{\frac{2y^2}{v}}\left(a/2\right)$$

$$\text{Upper Limit} = \frac{v+w_M^2}{2(y+w_M)}\left(c^2\right)^{-1}_{\frac{2(y+w_M)^2}{v+w_M^2}}\left(1-a/2\right)$$

where y is the age-adjusted death rate, v is the variance as calculated as shown below, w_M is the maximum of the weights $s_i P_i$, $1-a$ is the confidence level desired (e.g., for 95% confidence intervals, a = 0.05), and $\left(c^2\right)^{-1}_x$ is the inverse of the c^2 distribution with x degrees of freedom.

$$v = \sum_{i=1}^{m} d_i\left(s_i/P_i\right)^2$$

References

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Chiang, C. L. Standard error of the age-adjusted death rate.*Vital Statistics, Special Reports* 47:271-285, USDHEW, 1961.

Fay, M.P. and Feuer, E.J. Confidence intervals for directly rates: a method based on the gamma distribution. *Stat Med*16:791-801, 1997

Appendix B: Sources of Additional Information

For more information on cancer, risk factors or prevention strategies please refer to the following resources:

1-800-4CANCER: A cancer information service of the National Cancer Institute

American Cancer Society, Western-Pacific Division: 1-800-729-1151 ext. 3307
American Cancer Society. 1998 Cancer Facts and Figures
American Cancer Society website, http://www.cancer.org/

National Cancer Institute. Cancer Net: A Service of the NCI, http://cancernet.nci.nih.gov/

Schottenfeld, David and Fraumeni, Joseph F. Jr. Cancer Epidemiology and Prevention, Second Ed. Oxford University Press, 1996.

Washington State Department of Health. Health of Washington State. September 1996.

Fred Hutchinson Cancer Research Center website: http://www.fhcrc.org/science

American College of Surgeons National Cancer Database website: http://www.facs.org

National Program of Cancer Registries website: http://www.cdc.gov/cancer/index.htm

Appendix C: Advisory Council Members

Jonathan Britell, MD	Washington State Medical Oncology Society
Teresa Busch, CTR	Washington State Tumor Registrars Association
David Byrd, MD, FACS	American College of Surgeons
Joe Campo	Washington State Cancer Registry
David Corwin, MD	Pathology Associates
Joan Craig, MD	Oncologist
Connie Grace, LPN, CTR	Washington State Tumor Registrars Association
Kay Hicks, ART, CTR	Blue Mountain Oncology Program
M. Ward Hinds, MD, MPH	Snohomish Health District
Gordon Klatt, MD, FACS	MultiCare Medical Center
Patti Migliore	Western Pacific Division, American Cancer Society
Elizabeth Nucci	Washington State Hospital Association
Tana Olson, CTR	Washington State Tumor Registrars Association
Mary Potts, RRA, CPA, CTR	Cancer Surveillance System of the Fred Hutchinson Cancer Research Center
Brent Reece, MD	Madigan Army Medical Center
Steve Schwartz, PhD	Cancer Surveillance System of the Fred Hutchinson Cancer Research Center
Paul Stepak, MD, MPH	Spokane County Health District
Nicole Urban, ScD	CPRP, Fred Hutchinson Cancer Research Center
Juliet VanEenwyk, PhD	Washington State Department of Health
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Appendix D: Washington State Registry Contacts

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